

July 12, 2006

MEMORANDUM – Internal Review Draft

To: James Johnston, P.E., Regional Administrator, DEQ-IFRO
Greg Eager, P.E., Regional Engineering Manager, DEQ-IFRO

From: Tom Rackow, P.E., Staff Engineer, DEQ-IFRO

RE: Staff Analysis of the Wastewater Reuse Permit Application Report for the City of Tetonia, Teton County, Wastewater Reuse Permit Application Request LA-000208-01 (Municipal Wastewater).

1.0 Purpose

The purpose of this memorandum is to satisfy the requirements of IDAPA 58.01.17.400.04 for issuing Wastewater Reclamation and Reuse Permits.

The City of Tetonia (City) is the owner of a wastewater treatment facility located in Teton County, Idaho. The facility consists of a single cell facultative lagoon that presently discharges to an un-permitted wastewater land application site. The current lagoon is undersized and does not contain sufficient winter storage capacity, resulting in the need for emergency discharge to the un-permitted land application site at least twice per year. The effluent from the lagoon is land applied to approximately 16 acres adjacent to the lagoon. The flood-irrigated land application system was included and constructed as part of the original design in 1986, but has never been permitted or approved by DEQ.

The City's drawdown activities were discovered by DEQ during a public water system sanitary survey in 2003. Since October 2003, DEQ has issued five emergency land application approvals to allow the City to perform the spring and fall drawdowns with specific constraints. During this period from 2003 to spring 2006, the City performed a Facility Planning Study to evaluate the entire wastewater collection and treatment system, and to recommend solutions for the inadequate storage capacity of the facultative lagoon.

The Facility Planning Study was recently completed, and it summarizes the recommendations to improve the City's wastewater system. Some of the improvements include construction of a new storage lagoon, an enlarged (or possibly new) land application site, and installation of chlorination equipment.

A Consent Order between the City and DEQ was signed on March 14, 2006 which requires the City to implement the recommended improvements outlined in the Facility Planning Study. Because the improvements will not be complete until the autumn of 2008, the current land application system will need to be used during the interim period. As part of the Consent Order, DEQ has agreed to permit the existing land application site on a temporary basis until the permanent wastewater treatment and disposal

improvements are constructed in 2008. Permitting the existing system will ensure that it is operated in a manner that is protective of human health and the environment.

2.0 Process Description

The following provides brief descriptions of site location, ownership, treatment processes and flows, and land application site characteristics.

2.1 Site Location

The City of Tetonia is in Teton County in eastern Idaho, as shown on the vicinity map, Figure 1. State Highway 33 connects Tetonia with Sugar City to the west and Driggs to the south. Tetonia is approximately 7 miles north northwest of Driggs in the Teton Valley. Tetonia is located at the convergence of the Teton Basin and the Teton foothills to the east. According to the permit application, the Teton Basin slopes gently to the west with topography in the city sloping by about 25 feet from the foothills on the east to the west edge of town (Park, 2006).

Tetonia is a small rural community in Teton County. The City is primarily a service area for local farming operations. The area to the west is used for farming, and the land to the north, east, and south (adjacent to city limits) is not currently used (Park, 2006).

The City's wastewater treatment facility is located approximately ½-mile west of the city as shown in Figure 2. According to the permit application, the reuse site is 1/4 –mile or more away from any dwellings, areas of public access, canals/ditches, private water sources, and public water sources. Spring Creek flows intermittently on the south and west side of the site, approximately ¼-mile away. An aerial map with land owners is shown in Figure 3.

2.2 Site Ownership

The current land application reuse site is owned and operated by the City of Tetonia. The City is not leasing or renting any portion of the current reuse area, and is not contracting any portion of the reuse management activities. The treatment lagoon and reuse area is 20 acres which was purchased in pieces in 1986 and 1987. A permanent 20-foot easement provides maintenance access from the city to the treatment plant facilities (Park, 2006).

2.3 Process Flow Description

The wastewater had not been routinely sampled prior to the Facility Planning Study (FPS). During the course of the FPS, wastewater samples were collected and analyzed. The wastewater is classified as domestic. The application estimates that approximately 11.5 million gallons of effluent will be distributed to the reuse site annually.

Wastewater is collected primarily in 8-inch concrete pipe, flows by gravity to the west edge of town, and then to the City's only lift station next to the treatment lagoon. The influent is pumped from the lift station into the single cell facultative lagoon by way of two pumps that are wired to start and stop at the same time. If the influent lift station became inoperable, untreated wastewater would flow into a nearby ditch that has historically been used for flood irrigation of the existing reuse site. The lift station would need to be pumped with a rented auxiliary pump until repairs could be made (Park, 2006).

The single cell facultative lagoon is 1.7 acres when full, and can hold approximately 4.8 million gallons. Wastewater enters the lagoon in the southwest corner. The lagoon outlet is in the northeast corner where effluent flows by gravity to a concrete transfer structure north of the lagoon. The transfer structure is used to distribute effluent to the reuse site. As part of the Facility Planning Study, sludge depths were measured in the lagoon at 9 inches near the inlet and 6-8 inches elsewhere (Park, 2006).

2.4 Reuse Site Description

The land application (reuse) site is 15.7 acres, and is shown in Figure 4. The site was historically irrigated using flood irrigation. The soil is quite coarse and gravelly, and the site is not cropped – only weeds. The ground surface is uneven and would likely require significant work to prepare it for growing a crop. Due to the temporary nature of this permit, and the significant expense of establishing a viable crop on a temporary site, DEQ will not require any crops at this time.

The transfer structure was historically used to transfer effluent from the lagoon to the wastewater reuse site via flood irrigation. Due to the coarse soils at the site, wastewater would typically infiltrate within the main distribution ditch prior to ever reaching the individual head gates. DEQ has requested and the City has agreed to install a sprinkle irrigation system to provide more uniform coverage of the site. More uniform coverage will reduce the potential for deep percolation and ground water contamination.

Treated wastewater will be pumped out of the existing concrete transfer structure using a 30hp centrifugal pump capable of 400 gpm at 85 psi. Wastewater will be carried to two (2) big guns mounted on portable cart assemblies using standard 4-inch aluminum irrigation pipe. The cart assemblies will allow the guns to be manually relocated on a regular basis. The guns will cover 1.8 acres each (3.6 acres total). The operator will move each end gun at the end of each week, covering the entire 15.7 acre site once per month.

The water balance included in the application indicates influent will be stored November through March. Effluent will be land applied at a uniform rate of approximately 1.65 MG/month from April through October. The reuse permit will specify application during the Growing Season only (April 1 – October 31).

3.0 Summary of Events

The following is a summary of events based on a review of the City's file at the Idaho Falls Regional Office:

- 05/12/87 – As-Built drawings are received for newly constructed wastewater collection and treatment system at City of Tetonia.
- 07/08/88 – DEQ inspects the wastewater treatment and collection system. DEQ requests city submit a wastewater land application permit application to DEQ. DEQ has no record of a permit application from the City.
- 02/18/03 – DEQ performs a public water system site inspection at Mayor Kopplow's request. DEQ learns that the land application system is still in operation. DEQ begins working with City to bring the current wastewater system into compliance with IDAPA 58.01.17 by recommending they complete a permit application as soon as possible.
- 10/22/03 – DEQ receives letter from Mayor Kopplow requesting approval for emergency drawdown of lagoon prior to winter. Letter also notifies DEQ that the City has hired an engineering firm to perform a wastewater Facility Planning Study.
- 10/29/03 – DEQ issues 1st emergency drawdown approval.
- 04/20/04 – DEQ issues 2nd emergency drawdown approval.
- 11/05/04 – DEQ issues 3rd emergency drawdown approval.
- 04/04/05 – DEQ issues 4th emergency drawdown approval.
- 12/16/05 – DEQ issues 5th and final emergency drawdown approval. Approval letter requests City enter into a Consent Order with DEQ to ensure Facility Planning Study is finalized and ensure City moves forward with the long-term solutions for wastewater treatment and disposal, as recommended in the FPS.
- 01/09/06 – DEQ issues draft Consent Order to City for review and comment.
- 01/12/06 – Meeting held between DEQ and City to discuss draft Consent Order.
- 03/14/06 – DEQ issues final Consent Order to City of Tetonia. Consent Order requires 1) Submittal of application and permitting of current land application system, and 2) completion of construction of final improvements by September 1, 2008.
- 03/31/06 – DEQ receives complete Reuse permit application for current land application system.

4.0 Site Characterization

Section 4 describes the climate, soils, ground water, and surface water characteristics of the site.

4.1 Climate

Tetonia has a semi-arid climate. Data from the Tetonia Experiment Station reports an average annual precipitation of about 16 inches. Prevailing winds are out of the southwest. The soil survey for Teton county (USDA, 1969) estimates 30 – 40 inches of free surface evaporation from lakes and ponds in the area. Approximately 80% of the year's evaporation occurs between April and October. There are 55 – 85 frost-free days each year. The mean temperature of Tetonia ranges from around 16 degrees in January to 62 degrees in July. Average temperature extremes ranges from 5 degrees F in winter to 80 degrees F in summer (Park, 2006).

4.2 Soils

Soils at the land application area consist of Driggs and Wiggleton Series soils. The Driggs soils are moderately deep and well-drained. The upper layer is dark brown silt loam about 25 inches thick. From 25-42 inches is a layer of brown to light brownish grey coarse sand with gravel and cobbles. From 42-60 inches is light brownish grey, coarse gravel and cobbles (Park, 2006).

The Wiggleton soils are more coarse than the Driggs series, with the top 7 inches being dark grayish brown gravelly loam. From 7 – 14 inches is a layer of brown very gravelly loam. From 14 – 60 inches is light brownish grey gravel (Park, 2006).

Soils at the reuse site have not been monitored in the past. Staff recommends the reuse permit include fall soil sampling.

4.3 Ground Water

The hydrogeology of the site is not well understood at this time. The reuse site does not have monitoring wells, and water quality samples from the immediate area are not available. Ground water is assumed to follow the topography and flow in a westerly direction toward the Teton river. The well logs for Section 29, presented in the application, indicate a static water table between 30 – 90 feet below ground surface. The application also states that seasonal high ground occurs at a depth of 2 – 5 feet during the summer. This shallow water is assumed to be influenced by irrigation practices in the valley.

A Source Water Assessment was completed by DEQ for the City of Tetonia's Public Water System in July 2001. The assessment indicates a regional ground water flow direction to the west, towards the Teton river. The area is described as having well drained soils with a vadose zone comprised of sand and gravel. Ground water is described as a shallow, unconfined to semi-confined alluvial aquifer. The regional aquifer is recharged primarily by surface water irrigation, direct precipitation, and canal leakage (DEQ, 2001).

There are four wells listed on the Idaho Department of Water Resources web site that could be within ¼ mile of the land application site. A log for each well is included in the permit application. Two of the wells are reported to be in the northeast corner of the southeast corner of Section 29 which is where the land application site is located. These wells are likely irrigation wells or mistakenly reported. The application states that City employees report that there are no drinking water wells within ¼-mile of the lagoon or reuse site (Park, 2006).

A Well Location Acceptability Analysis has not been performed. Ground water quality has not been monitored near the reuse site. And ground water has not been modeled near the reuse site. Due to the temporary nature of this permit, staff does not recommend further analysis or the installation of monitoring wells at this time. If the City's long-term solution to wastewater management includes land application (at the current site or a different site), a rigorous hydrogeological investigation will need to be performed as part of that review and selection process.

4.4 Surface Water

The Teton River is more than three miles west of the reuse site and flows from south to north through the Teton Basin. Beneficial uses listed for the Teton River include cold water biota, salmonid spawning, primary contact recreation, drinking water supply, and special resource water. The Teton River does have a Total Maximum Daily Load (TMDL) limit for sediments and phosphorus; however, because of the distance to the river, the reuse site is considered to only have the potential to impact ground water.

Spring creek is approximately ¼-mile or more to the south and west of the reuse site. The creek flows from east to west toward the Teton river. The creek's flow peaks in early summer (snow melt) at around 180 cfs and tapers down to less than 10 cfs by September. The creek occasionally dries up west of the City (Park, 2006).

5.0 Cropping Plan

The current reuse site has not supported a crop in the recent past and fertilizers are not known to have been used. Due to the temporary nature of this permit, DEQ will not require the establishment of a crop at this time. However, DEQ does encourage the City to begin establishing some sort of vegetative cover, especially if the current site is being considered for incorporation into the long term solution for wastewater management. Establishment of vegetation will promote greater treatment through improved evapotranspiration rates, prevent erosion, and improve the soil conditions for future crop production. The application suggests, and DEQ supports, that no fertilizers will be added at this time. The permit specifies that supplemental fertilizer is not allowed.

6.0 Wastewater Characteristics and Proposed Loading Rates

Section 6 describes the wastewater characteristics, hydraulic loading, constituent loading, and proposed permit limits.

6.1 Wastewater characterization

Based on historical data, the wastewater volume that the city needs to apply under this temporary permit is approximately 11.5 million gallons per year (applied during the growing season).

The City has not historically monitored either the influent or the effluent quality at this site. During the course of the Facility Planning Study, several samples were collected. The average concentrations based on samples collected in 2004 are shown in Table 1.

Table 1. Average Wastewater Characteristics from 2004.

Constituent	Units	Influent	Effluent
BOD	mg/L	173	42
TSS	mg/L	135	42
Total Nitrogen as N	mg/L	34.0	16.8
Total Phosphorus as P	mg/L	4.79	2.42

The actual test results are provided in the permit application appendix. The wastewater influent at this facility would be considered weak to medium (Metcalf & Eddy, 1991).

6.2 Hydraulic Loading

Based on the limited size of the lagoon and the influent flow rates, the City will need to land apply approximately 11.5 MG from April through October. Based on 150 working days in seven months, the effluent will be evenly distributed at a rate of approximately 410,000 gal/week (Park, 2006). Using two irrigation guns at 3.6 acres total (1.8 acres each), the City will apply wastewater at a rate of 3.9 inches/acre/week. This rate is elevated considering the coarse soils (limited water holding capacity) and lack of an established crop. However, the projected volume must be applied to preserve the integrity of the lagoon (prevent overtopping) until improvements are constructed in 2008. Table 2 shows the hydraulic balance on the lagoon. The lagoon's capacity is 4.8 MG with a freeboard of 1.5 feet. The lagoon will be at its maximum capacity in March.

Table 2. Annual Lagoon Water Balance (Park, 2006).

	Inflow to Lagoon (gal)	Effluent to Land Application (gal)	Lagoon Storage (gal)
November	958,333	0	958,000
December	958,333	0	1,916,000
January	958,333	0	2,874,000
February	958,333	0	3,832,000
March	958,333	0	4,790,000
April	958,333	1,642,857	4,105,714
May	958,333	1,642,857	3,421,429
June	958,333	1,642,857	2,737,143
July	958,333	1,642,857	2,052,857
August	958,333	1,642,857	1,368,571
September	958,333	1,642,857	684,286
October	958,333	1,642,857	0
Yearly Total	11,500,000	11,500,000	

An hour meter will record the time that the irrigation pump is running. The hour meter data will be used in conjunction with the pump's performance curve to determine the quantity of wastewater applied to the reuse site (Park, 2006).

To account for variability in the estimated discharge and unforeseen weather conditions during the growing season, staff recommends a hydraulic loading permit limit of 13 MG for the Growing Season only. This loading rate provides approximately a 13% safety factor for the projected loading rate. At 13 MG on 15.7 acres, the projected application depth will be approximately 4.4 inches/acre/month (30.5 in/ac per season). Assuming that the weeds on site will grow vigorously with frequent wastewater applications, an application depth of 30.5 inches/season seems reasonable. For comparison, spring grain in the Teton Valley, irrigated with big guns at 60% efficiency, would require an application of approximately 35.2 inches/season.

As stated earlier, each gun covers 1.8 acres each or 3.6 acres total. The operator will move each gun at the end of each week and the entire 15.7 acre site will be covered once per month. The 3-week rest periods between individual locations will promote improved treatment efficiency and reduce the potential for ground water impacts.

Land Application during the Non-Growing Season will not be allowed.

6.3 Constituent Loading

Based on a permitted hydraulic limit of 13 MG/yr and the estimated average effluent concentrations listed in Table 1, the constituent loading to the 15.7 acre reuse site is shown in Table 3.

Table 3. Estimated constituent load and recommended permit limit.

	WW Volume (MG)	Avg. Effluent Concentration (mg/L)	Estimated Loading	Recommended Permit Limit
Total Nitrogen as N	13.00	17	116 lb/ac-yr	125 lb/ac-yr
Total Phosphorus as P	13.00	2.4	17 lb/ac-yr	20 lb/ac-yr
BOD ¹	13.00	42	1.4 lb/ac-day	None ³
COD ²	13.00	105 ²	3.4 lb/ac-day ²	25 lb/ac-day ³

1. BOD load based on 214-day seasonal average.

2. COD concentration estimated. COD concentrations are approximately 2.5 times greater than BOD for a municipal effluent without significant industrial contributions (Metcalf & Eddy, 1991).

3. Permit limit will be based on COD, not BOD.

Because the reuse site is not formally cropped and consists only of resident grasses and weeds, estimated loading rates were compared against NRCS recommended fertilization rates for non-legume pastures, available at www.nrcs.usda.gov/technical/land/pubs/nlapp1a.html.

Total nitrogen loading will be reasonable if any vegetation (including weeds) continues to become more established as more frequent irrigation occurs. NRCS recommends a nitrogen loading rate of 50-100 lb/ac-yr for non-legume pasture lands. The recommended permit limit of 125 lb/ac-yr will provide a slight “buffer” to the potential for the typical variability of effluent concentrations and flow rates.

Phosphorus loading of 17 lb/ac-yr is less than NRCS recommendations of 20-40 lb/ac-yr. Staff recommends a permit loading limit of 20 lb/ac-yr.

Seasonal average BOD loading of less than 2 lb/ac-day is very low. The primary concerns with organic loading are odors and the potential for overloading of solids which plug soil pores (thus reducing infiltration rates). To account for all organic loading, reuse permits typically require monitoring of Chemical Oxygen Demand (COD) which accounts for both biological and chemical oxidation processes. Metcalf & Eddy (1991) indicate COD concentrations for domestic wastewater, without significant industrial components, are approximately 2.5 times greater than BOD. Therefore, the COD values listed in Table 3 were estimated from the average BOD concentrations. The estimated seasonal average COD loading of 3.4 lb/ac-day is significantly less than 25 lb/ac-day which is the level typically deemed acceptable by the Department. Staff recommends setting a COD loading limit of 25 lb/ac-day.

7.0 Monitoring

The current effluent system does not have a flow meter (there is a meter on the influent). Effluent volume to the reuse site will be measured using an hour meter that records the run time of the 30 hp irrigation pump in the transfer structure. The operator will record the pump run hours and the location of each end gun assembly on a weekly basis. The pump flow rates will be calibrated by recording the drawdown within the concrete transfer structure (a known volume) with the inlet valve closed. Staff recommends that the City monitor and report flows on a weekly basis as proposed. Tracking weekly flows will help to evaluate the irrigation sets to ensure that the entire site is watered evenly and covered on a monthly basis.

Staff recommends monthly grab samples for monitoring wastewater quality. Effluent wastewater sampling shall consist of Total Coliform, Chemical Oxygen Demand (COD), Total Kjeldahl Nitrogen (TKN), Nitrite + Nitrate as N (NNN), Total Phosphorus, Total Dissolved Solids (TDS) and pH.

Staff recommends annual soil sampling in the fall, upon completion of land application activities for the season. Because of the potential for non-uniformity of the portable end gun irrigation system and the 15.7-acre size of the reuse site, staff recommends the City use 10 sub-sample locations for collecting the three composite compliance samples. Soil sampling shall consist of Electrical Conductivity, pH, Nitrate as N, Ammonium as N, and plant available phosphorus as P using the Olsen Method.

The flow, wastewater quality, and soil monitoring data shall be used to perform various calculations as described in Section F of the draft permit, including monthly and seasonal irrigation rates, nutrient loading, and COD loading.

8.0 Site Management

The wastewater collection, treatment, and reuse systems will be operated by Mitch Smaellie. Mr. Smaellie is currently licensed in wastewater collection and will “obtain his land application certification in the future.”(Park, 2006). The City has no outside agreement with any party to operate and maintain the reuse site. Section 203 of the Wastewater Rules (IDAPA 58.01.16) require licensed operators for collection , treatment, and land application. Operators must currently be licensed for collection and treatment, and must become licensed for land application no later than April 15, 2007. The City is encouraged to obtain all necessary certifications as quickly as possible.

8.1 Seepage Rate Testing

The seepage rate on the single cell lagoon was tested in October 2004 following the 15-day testing protocol recommended by DEQ. Results indicate a seepage rate of 0.212 inches/day, which is acceptable. DEQ criteria allows a seepage rate up to 0.25 in/day for an existing lagoon. The lagoon, if still in operation at that time, will require another

seepage test in 2009. Because this temporary permit is expected to terminate in fall of 2008, no seepage rate testing will be specified at this time.

8.2 Buffer Zones

The site is approximately ¼-mile away from any dwellings or areas of public access. The site is more than 1,000 feet from canals, ditches, and other water sources. The wastewater treatment plant is surrounded by a fence and the access road is gated both at the treatment plant (lagoon) and at the county road ¼-mile to the south. The gate at the plant has a sign to alert those entering the site that municipal effluent is land applied (Park, 2006).

Effluent will not be disinfected under this temporary permit. The only activity in the immediate reuse area is farming to the west. According to the permit application, there is an adequate buffer between the reuse site and public access. However, the applicant does recommend, and DEQ agrees, that the farmers to the west should be informed of the change in irrigation methods at the reuse site to sprinkler irrigation. DEQ recommends posting every 500 feet and at each corner of the perimeter of the buffer zone(s) of the site. The signs should read “Sewage Effluent Application – Keep Out”, or equivalent.

8.3 Runoff Management

According to the permit application, operators will monitor irrigation to ensure that irrigated effluent does not pond or runoff the site (due to the coarse soils at this site, DEQ does not expect ponding to occur). The application also states that effluent should not be applied during heavy rain events. Also, the end gun assemblies will be moved weekly to reduce the potential for saturation and runoff.

DEQ believes the proposed management activities, in combination with the soil properties at this site, will adequately protect against ponding and runoff for the life of this temporary permit. No further runoff management plans are required at this time.

8.4 Waste Solids Management

Waste Solids are not expected to be generated during the life of this temporary permit. Therefore, a Waste Solids Management Plan is not required at this time. If the 2008 facility upgrades include the abandonment or demolition of the current lagoon, a Waste Solids Management Plan will be required as part of the plan and specification review at that time. The Waste Solids Management Plan approval will be required prior to construction activities.

8.5 Nuisance Odor Management

Nuisance odors have not been a problem at the current facility, and are not expected during the life of this temporary permit. The change to sprinkler irrigation has the potential for creating more odor drift than flood irrigation; however, buffer zones appear to be adequate to control the potential. A Nuisance Odor Management Plan for this temporary permit is not required.

8.6 Grazing

Animal grazing of the reuse site will not be allowed for the life of this permit. Animals shall not be grazed on land where Class E municipal wastewater is applied, and animals shall not be fed harvested vegetation irrigated in this manner within four (4) weeks of application. Because grazing is not allowed, and an established crop suitable for grazing is not expected, a Grazing Management Plan for this temporary permit is not.

8.7 Salt Management

The municipal wastewater applied to this reuse site is considered weak to medium with acceptable levels of salts that are not expected to inhibit the soils or vegetation of the site. A Total Dissolved Solids management plan for this temporary permit is not required.

9.0 Recommendation

Staff recommends that the attached Municipal Wastewater Reuse Permit be issued. The permit specifies loading limits for nitrogen, COD, NGS and GS hydraulic loading rates, and establishes monitoring requirements to adequately protect public health and the environment. Monitoring and reporting requirements to evaluate system performance, and to determine permit compliance, have been specified

10.0 References

Park, C. – City of Teton Wastewater Reuse Permit Application Report, Schiess and Associates Consulting Engineers, March 2006.

USDA – “Soil Survey, Teton Area Idaho – Wyoming”, United States Department of Agriculture, Soil Conservation Service, October 1969.

DEQ – “Source Water Assessment Final Report” City of Teton Public Water System (PWS) #7410012. Idaho Department of Environmental Quality, July 18, 2001.

Metcalf & Eddy – “Wastewater Engineering: Treatment, Disposal, and Reuse”, 3rd Ed., Metcalf & Eddy, Inc., 1991.

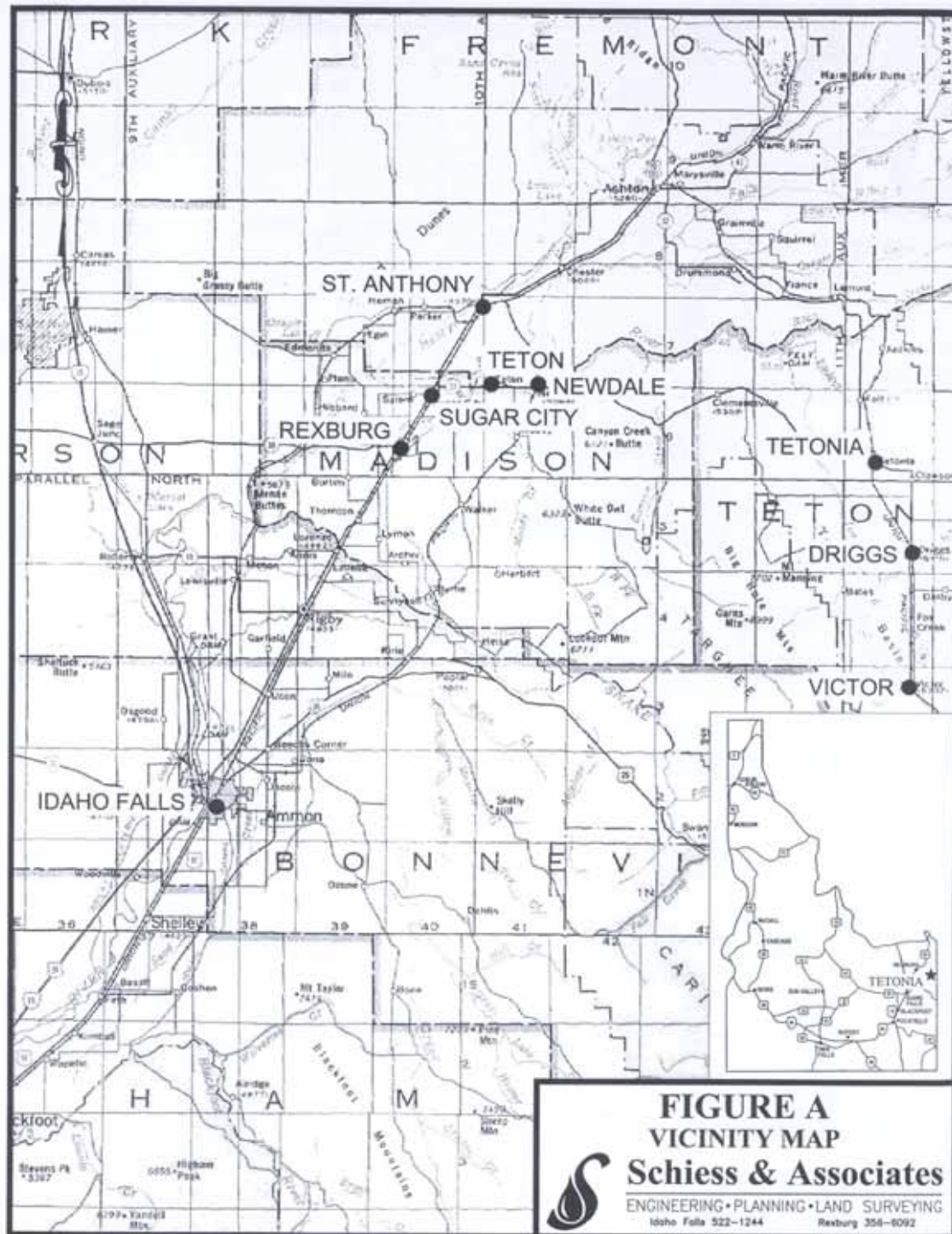


Figure 1. Vicinity Map. (Park, 2006)

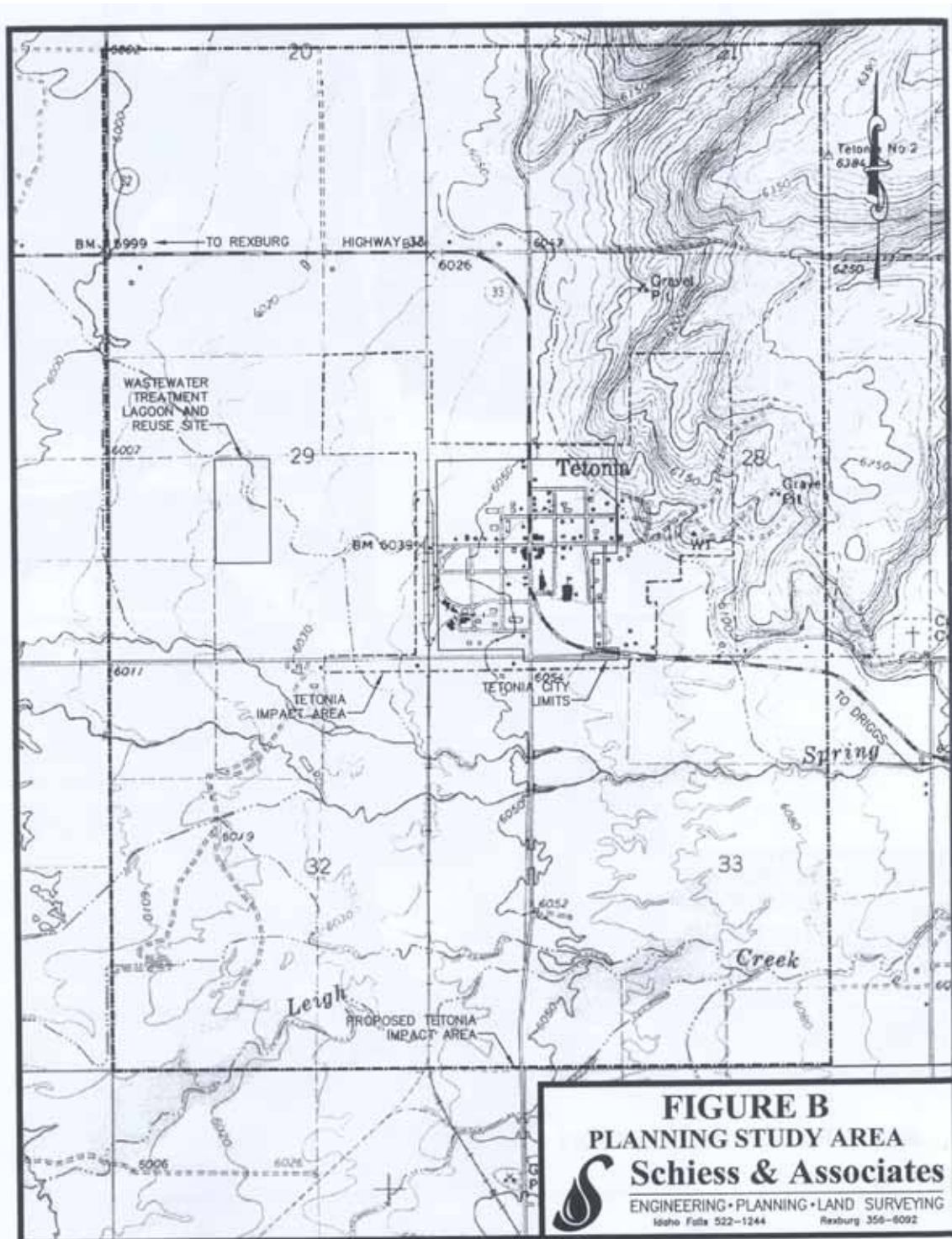


Figure 2. Reuse Site Location. (Park, 2006)

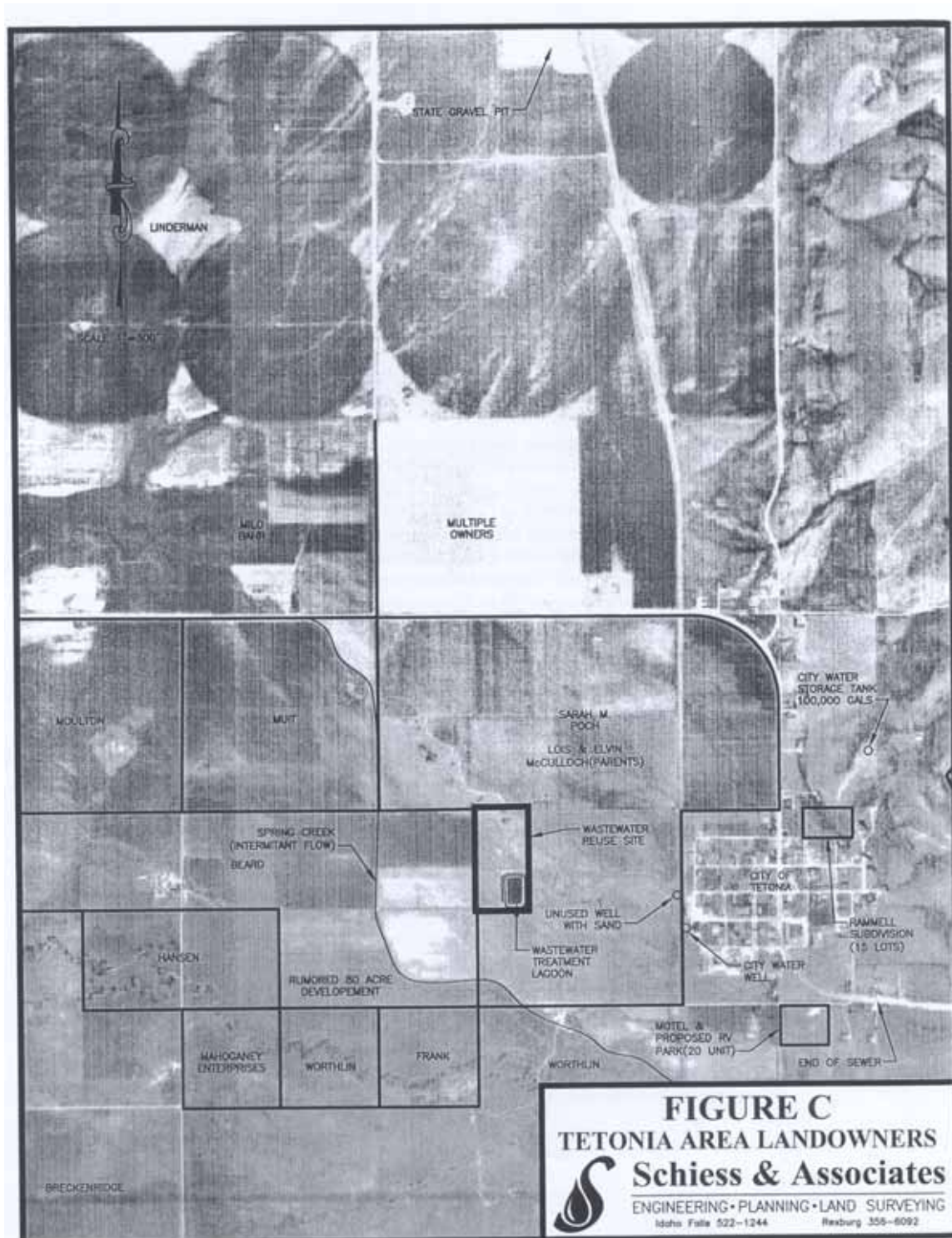


Figure 3. Land Ownership. (Park, 2006)

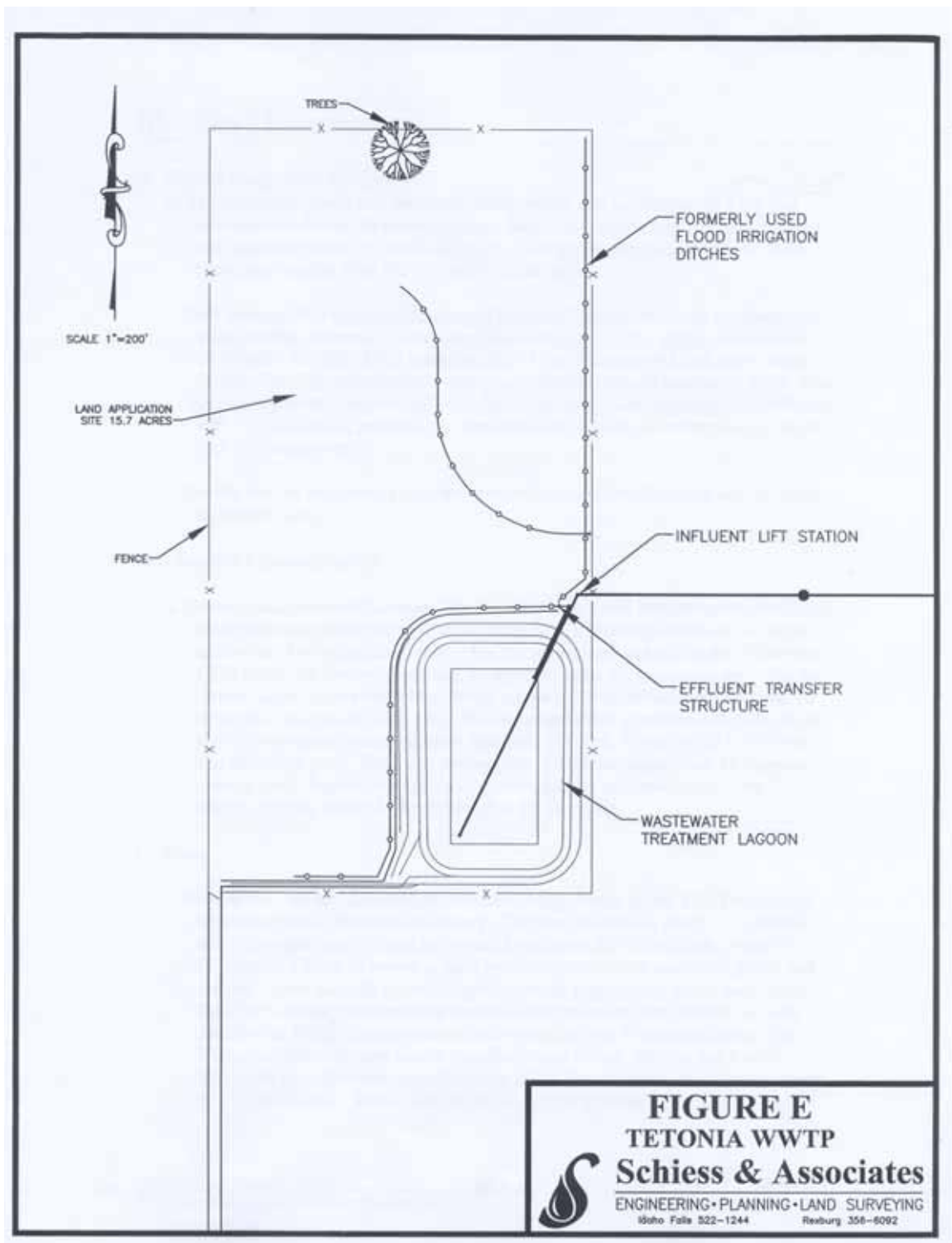


Figure 4. Reuse Site. (Park, 2006)